LIST OF PUBLICATIONS

July 1 to December 31, 1965

FOREST PRODUCTS LABORATORY
FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE
MADISON, WISCONSIN 53705

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LIST OF PUBLICATIONS

JULY 1 TO DECEMBER 31, 1965

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Chemistry of Wood and Derived Products

Highly Technical

1. Chemotaxonomy as an aid in differentiating wood of eastern and western white pine, by Margaret K. Seikel, Stan S. Hall, Linda C. Feldman, and Robert C. Koeppen. Amer. Jour. Bot. 52(10): 1046-1049, Nov.-Dec. 1965.

   Heartwoods from eastern and western white pine can be separated, with about 95% accuracy, by subjecting their acetone extracts to simple paper chromatography. This differentiation is possible because the relative proportions of certain flavanones vary in the two species, and when these are treated with the chromogenic spray,

distinguishing colors are produced.

Dimensional stabilization of hardboard by combined acetylation and heat treatment, by Leif O. Klinga, Harold Tarkow, and Ernst L. Back. Svensk Papperstidn. 68(17): 583-587, 1965.

Heat treatment followed by acetylation of Asplund hardboards gives the greatest reduction in water absorption, equilibrium moisture adsorption, and dimensional movement. Reversing the treating order gives smaller reductions in these properties.

2. Dynamic osmotic pressure measurements on low molecular weight polymers, by William C. Feist. Jour. Polymer Sci. B3(10): 875-878, Oct. 1965.

With the aid of a high-speed, dynamic osmometer and a highly selective membrane, it has been possible to accurately measure the $\overline{M}_n$ (number average molecular weight) of several well-characterized, narrow molecular weight distribution polystyrene samples. The range of $\overline{M}_n$ measured was 1,200 to 78,000.

Enzymatic dehydrogenation of lignin model phenols, by John C. Pew, William J. Connors, and Alice Kunishi. Chim. et Biochim. de la Lignine, de la Cell. et des Hémicell. Int. Symp. Proc., pp. 229-245, Grenoble, France, June 29-July 4, 1964.

Guaiacyl- and syringylpropane-type lignin model compounds, with and without conjugation in the side chain, were dehydrogenated with peroxide and peroxidase. Bi-

phenyl and diphenyl ether dimers were obtained with guaiacyl compounds, while a portion of both guaiacyl and syringyl compounds became hydroxylated in the side chain through direct formation of quinone methide intermediates.

3. Structure of contortadiol (agathadiol), contortolal (agatholal), and hydroxyepimanool (epitorulosol), by John W. Rowe and Gary W. Shaffer. Tetrahedron Lett. No. 30, pp. 2633-2637, 1965.

   The structures of three labdane diterpenes previously isolated from lodgepole pine bark have been completely elucidated. Alternate names are suggested. Agathadiol is a known natural product. The agatholal and epitorulosol have not been found previously in nature.

4. Triterpenes of pine barks: Naturally occurring derivatives of serratenediol, by John W. Rowe and Carol L. Bower. Tetrahedron Lett. No. 32, pp. 2745-2750, 1965.

   Pine barks have been found to contain a series of new triterpenes related to the unusual serratenediol. The complete proof of structure of six naturally occurring derivatives of serratenediol has characterized two isomeric diols, a monomethyl and a dimethyl ether, and methoxy and a hydroxy ketone.

Fire Properties

5. Corridor wall linings-Effect on fire perform-

ance, by E. L. Schaffer and H. W. Eickner. Fire Technology 1(4): 1-13, Nov. 4, 1965.

During December 1964 and January 1965, research was conducted to determine the effects of three types of wall linings on fire performance within a partially ventilated corridor. Temperature and light transmission data were recorded, and gas samples were collected for immediate and later analysis.

6. Effect of wall linings on fire performance within a partially ventilated corridor, by E. L. Schaffer and H. W. Eickner. U.S. Forest Serv. Res. Paper FPL 49, 29 pp., Dec. 1965.

Presents the results of three full-scale fire tests within a partially ventilated 73-foot corridor, where the first test was made with essentially noncombustible wall and ceiling linings, the second test with 1/4-inch prefinished wood-grained hardboard wall linings, and the third test with the walls lined with red oak flooring.

7. Predicting maximum surface temperatures of wood in exterior exposures, by Eugene M. Wengert. Forest Prod. Jour. 15(7): 263-268, July 1965.

An equation for predicting the maximum temperatures of products was developed from fundamental energy balance considerations. The derivation, applicability, and limitations of the energy balance equation are discussed.

8. Determining resistance to soft-rot fungi, by C. G. Duncan. U.S. Forest Serv. Res. Paper FPL 48, 13 pp., Dec. 1965.

   A laboratory procedure is outlined that incorporates techniques found to promote soft rot by several fungi. The principal findings of experiments underlying the procedure are also presented.

9. Fundamental characteristics of wood decay indicated by a sequential microscopical analysis, by W. W. Wilcox. Forest Prod. Jour. 15(7): 255-259, July 1965.

   Very thin cross-sections of pine and sweetgum sapwood, in progressive stages of decay by a brown-rot and a white-rot fungus, were examined microscopically. The development of attack on the various segments of the cell wall, with the four combinations of wood and fungus types, is described in detail.

10. Fungi associated with principal decays in wood products in the United States, by Catherine G. Duncan and Frances F. Lombard. U.S. Forest Serv. Res. Paper WO-4, Oct. 1965.

    Data on the associations between almost 2,000 Basidiomycetous fungi and various decayed wood products are given. The data indicate the associations between the type of decay, the host wood and product, its preservative content, if any, the geographic area where the decayed product was found, and the decay fungus.

11. Accelerated aging of adhesives in plywood-type joints, by R. H. Gillespie. Forest Prod. Jour. 15(9): 369-378, Sept. 1965.

Adhesives in plywood-type joints were subjected to accelerated aging to determine the effects of the degrading influences of heat, moisture, and cyclic swelling and shrinking stresses. The rates of shear strength loss with time of exposure were shown to follow laws commonly associated with chemical reactions.

12. After two decades of service glulam timbers show good performance, by M. L. Selbo, A. C. Knauss, and H. E. Worth. Forest Prod. Jour. 15(11): 466-472, Nov. 1965.

Reports on 12 laminated bridges in service from 6 to 20 years. Douglas-fir and southern pine timbers laminated with resorcinol and phenol-resorcinol adhesives, treated with oil-borne preservatives, were excellent. Timbers in one bridge glued from wood treated with water-borne preservatives showed checking and delamination.

13. A comparison of the block shear, cross-lap tension, and glue-line cleavage methods of testing glued joints, by A. G. Stanger and R. F. Blomquist. Forest Prod. Jour. 15(12): 468-474, Dec. 1965.

Glued joints of radiata pine and tawa lumber were tested in the conventional block shear, cross-lap tension, and a modified cleavage procedure. The cleavage test gave the lowest percentages of wood failure.

The simpler-to-fabricate tension and shear specimens gave higher percentages of failure with the glues used.

14. Device for estimating wood or glue failure in glue block shear test, by Forest Products Laboratory. U.S. Forest Serv. Res. Note FPL-0102, 3 pp., Sept. 1965.

The new device is a rectangular piece of clear plastic material the size of the glue joint area of a shear-block specimen. Marked off on it are areas of various shapes, each representing 5 percent of the total glued area. By use of this device the wood failure can be estimated with reasonable accuracy, regardless of the shape of the breaks.

15. Performance of melamine resin adhesives in various exposures, by M. L. Selbo. Forest Prod. Jour. 15(12): 475-483, Dec. 1965.

After 20 years' outdoor exposure, melamine glue joints in Douglas-fir beams were excellent, and gave as high block-shear strength values as resorcinol and phenol-resorcinol glue joints similarly exposed. On oak, melamine glue joints showed progressive deterioration in continued salt-water soaking, and were near failure after 16 years, while phenol-resorcinol glue joints maintained their strength.

Packaging

16. Comparison of two specimen shapes for short column test of corrugated fiberboard, by

J. W. Koning, Jr. U.S. Forest Serv. Res. Note FPL-0109, 11 pp., Oct. 1965.

A comparative evaluation of short column test specimens of corrugated fiberboard indicated that the difference in average compressive strength was not significant between rectangular and necked-down shapes. Based on ease of specimen preparation, however, the rectangular specimen appears to be more practical for industry use than the necked-down shape.

17. New tests probe cushioning properties of corrugated board, by C. A. Jordan and Robert K. Stern. Package Eng. 10(12): 76-94, Dec. 1965.

Dynamic compression characteristics (peak acceleration-static stress curves) were conventionally determined for 4-ply pads of corrugated fiberboard and by a new method for 1-, 2-, 3-, and 5-ply pads. The new procedure, involving the use of a computer, promises important potential savings.

18. Phenolic resin treatment improves fibreboard compressive strength, by John W. Koning, Jr., and Donald J. Fahey. Package Eng. 10(10): 130-139, Oct. 1965.

The wet compressive strength of corrugated fiberboard containers was significantly improved through treatment of the paperboard components with a low-molecular weight, water-soluble, phenolic resin. However, the impact strength of the containers was reduced. Problems in treating the paperboard and manufacturing the containers were also discussed.

Highly Technical

19. Edgewise compressive strength of corrugated fiberboard as determined by local instability, by R. C. Moody. U.S. Forest Serv. Res. Paper FPL 46, 9 pp., Dec. 1965.

A method is presented for predicting the edgewise compressive strength of corrugated fiberboard. Local buckling was assumed to occur in the specimens and the edgewise compressive strength was calculated from critical buckling stresses for the components. Theoretical or calculated strength is compared with strength determined experimentally.

Plastics

Compression testing the unwoven fibre composite, by Karl Romstad. Reinforced Plastics 4(5): 16-18, Sept.-Oct. 1965.

Tension testing the unwoven fiber composite, by Karl Romstad. Reinforced Plastics 4(6): 16-17, Nov.-Dec. 1965

Methods of obtaining strength and elastic properties of plastic laminates reinforced with unwoven glass fibers were evaluated using the criteria of the strength values obtained and the failure characteristics observed. Variables investigated were specimen configuration and the manner of supporting and loading the specimens.

20. Effect of thermal cycling on tensile and compressive strength of reinforced plastic laminates, by Gordon H. Stevens. U.S.

Forest Serv. Res. Paper FPL 37, 9 pp., Aug. 1965.

Presents the modulus of elasticity and strength values of four reinforced plastic laminates in tension and compression at room temperature and at 500° F. Prior to evaluation at these temperatures, the test specimens were exposed to thermal-shock cycling.

21. Thermal conductivity temperature relationship for nine glass and asbestos fiber-reinforced aircraft plastics, by Wayne C. Lewis. U.S. Forest Serv. Res. Paper FPL 36, 14 pp., Aug. 1965.

The coefficients of thermal conductivity for mean temperatures ranging from about -300° to +500° F. were determined for nine combinations of asbestos fiber or glass fiber and cloth reinforcement, with epoxy, phenolic, silicone, phenyl silane, and epoxy-novalac resins.

Sandwich

Highly Technical

22. Effect of core thickness and moisture content on mechanical properties of two resin-treated paper honeycomb cores, by Paul M. Jenkinson. U.S. Forest Serv. Res. Paper FPL 35, 25 pp., Sept. 1965.

Presents results of compression and shear evaluations of two resin-treated paper honeycomb cores. The cores had densities of 1.7 and 3.7 pounds per cubic foot. Cores

were evaluated in thicknesses of 1/4 tc 2 inches and at several moisture contents ranging up to 80 percent.

23. Minimum weight structural sandwich, by E. W. Kuenzi. U.S. Forest Serv. Res. Note FPL-086, 15 pp., Rev. Oct. 1965.

Presents theoretical analyses for determination of dimensions of structural sandwich of minimum weight that will have certain stiffness and load-carrying capabilities. Includes a brief discussion of the resultant minimum weight configurations.

Seasoning

Highly Technical

24. Longitudinal permeability of green eastern hemlock, by Gilbert L. Comstock. Forest Prod. Jour. 15(10): 441-449, Oct. 1965.

A technique for measuring the longitudinal permeability of green wood is described. The variations within and between trees and the correlation between permeability and other physical properties were determined. The effect of steaming and extraction on heartwood permeability was investigated.

Timber Mechanics

25. Beam strength as affected by placement of laminae, by Peter Koch and Billy Bohannan. Forest Prod. Jour. 15(7): 289-296, July 1965.

The study showed that beams glued up from southern pine veneers were strongest and stiffest when assembled with the stiffest laminae in the outer portions and the most limber in the center. The beams, 100 inches long, were laminated from twenty-one 1/3-inch-thick S4S veneers, 3 inches wide.

26. Derivation of fiber stresses from strength values of wood poles, by L. W. Wood and L. J. Markwardt. U.S. Forest Serv. Res. Paper FPL 39, 9 pp., Oct. 1965.

Presents and discusses the authors' recommendations and modifications on fiber stresses made in Sectional Committee 05 on Wood Poles of the American Standards Association. Factors of variability, round form, moisture content, and effect of preservative treatment that influence fiber stress values for wood poles are discussed.

Effects of seven variables on properties of southern pine plywood. Pt. 3. Maximizing dry strength, by Peter Koch and P. M. Jenkinson. Forest Prod. Jour. 15(12): 488-494, Dec. 1965.

Discusses effects of seven variables on the strength properties of southern pine plywood evaluated at 11 percent moisture content. Properties studied were strength in true rolling shear, compression parallel to the grain, and modulus of elasticity parallel to the grain.

27. Evaluation of commercially made end joints in lumber by three test methods, by Billy Bohannan and M. L. Selbo. U.S. Forest Serv. Res. Paper FPL 41, 41 pp., Oct. 1965.

An evaluation of commercially fabricated, end-jointed laminations of various softwoods using three test methods to compare the tensile strength values as determined by each method and to investigate the correlation between tensile and bending strength. Both scarf- and finger-jointed type specimens were studied.

28. Exploratory development of tension test method for structural-size lumber, by Billy Bohannan. U.S. Forest Serv. Res. Paper FPL 40, 13 pp., Sept. 1965.

Wedge-type tension grips that have a slight taper over part of the contact surface between grip and specimen produced good anchorage characteristics to load tension specimens having a uniform cross section throughout their length. Such grips performed very well for material having approximately 12 percent moisture content.

29. Nondestructive testing of wood-status, needs and possibilities, by R. L. Youngs. Materials Evaluation 23(8): 372-376, Aug. 1965.

Discusses characteristics and specific mechanical and physical properties of wood and wood products requiring nondestructive evaluation, together with significant practical advances and potential or promising techniques that should be given further consideration.

30. Structural property estimation from density samples for western woods, by R. L. Ethington. Forest Prod. Jour. 15(10): 422-425, Oct. 1965.

The methodology of Phase IV of the Western Wood Density Survey makes it possible to evaluate all species on a reasonably equitable, continuing basis by means of specific gravity sampling. Guidelines are drawn for combining species into any desired groupings, with appropriate description of the corresponding heterogeneous property distributions.

Highly Technical

31. Buckling of simply supported plywood plates under combined edgewise bending and compression, by John J. Zahn and Karl M. Romstad. U.S. Forest Serv. Res. Paper FPL 50, 21 pp., Dec. 1965.

Theoretical buckling coefficients for simply supported, flat plywood plates under combined edgewise bending and compression are derived by treating plywood as an orthotropic plate. Curves of buckling coefficients are presented along with two examples of their use.

32. Deflection and stresses of tapered wood beams, by A. C. Maki and E. W. Kuenzi. U.S. Forest Serv. Res. Paper FPL 34, 55 pp., Sept. 1965.

Approximate mathematical relationships based on elementary Bernoulli-Euler theory of bending are developed for the general cases of shear and vertical stresses existing in flexural members with varying cross sections. Experimental evaluation substantiates the theoretical analysis and good correlations are observed between the the-

orethical and observed deflection relationships studied.

33. Lateral stability of deep beams with shear beam support, by John J. Zahn. U.S. Forest Serv. Res. Paper FPL 43, 33 pp., Oct. 1965.

An analysis of the stability of roof and floor systems whose proportions allow lateral buckling of the supporting beams, with particular attention to the stabilizing influence of the shear stiffness of the attached deck. Numerical results are presented in the form of curves for four cases.

Wood Fiber Products

Highly Technical

34. Determination of the relative bonded area of handsheets by direct-current electrical conductivity, by William E. Smith. Tappi 48(8): 476-480, Aug. 1965.

Discusses the determination of relative bonded area of pulp handsheets using direct-current electrical conductivity. Values for handsheets ranged from 23 percent for unbeaten pulp to 99 percent for pulp beaten 60 minutes.

35. Drying restraint: Its effect on the tensile properties of 15 different pulps, by Vance C. Setterholm and Warren A. Chilson. Tappi 47(11): 634-640, Nov. 1965.

Explains how handsheets from various pulp furnishes respond to the effect of restraint during drying, permanence of the

effects induced, and some basic density-property relationships for handsheets made from widely used papermaking furnishes.

36. Engelmann spruce, subalpine fir, and lodgepole pine mixtures for bleached groundwood, kraft, and sulfite viscose-grade pulp, by Forrest A. Simmonds. U.S. Forest Serv. Res. Paper FPL 38, 9 pp., Sept. 1965.

Describes pulping and bleaching experiments which show that good quality bleached groundwood and kraft pulps and sulfite viscose-grade pulps can be produced from a mixture of Engelmann spruce, subalpine fir, and lodgepole pine, with the exclusion of the pine from the mixture for the viscose pulp.

37. Sulfite pulping of Douglas-fir heartwood by two-stage processes using sodium, magnesium, and magnesium-ammonium bases, by Necmi Sanyer and E. G. Keller. Tappi 48(1): 545-552, Oct. 1965.

Douglas-fir was pulped by several of the newer modified sulfite processes. The results indicated that bleachable pulps can be produced and that pulp yields and strength vary with the process and degree of cooking.

38. Wood characteristics and kraft paper properties of four selected loblolly pines, by Von L. Byrd, E. L. Ellwood, R. G. Hitchings, and A. C. Barefoot. Forest Prod. Jour. 15(8): 313-320, Aug. 1965.

A study of the interrelationships between the physical properties of pulp, the chemical composition of the wood, and wood fiber morphology. The results showed no

indications that chemical constituents of wood exerted any specific effect on handsheet paper properties independently of their relationship with fiber morphology.

Wood in Construction

39. Development of an improved system of wood-frame house construction, by L. O. Anderson. U.S. Forest Serv. Res. Paper FPL 47, 13 pp., Oct. 1965.

A new system of wood-frame house construction promotes the use of low-grade wood. Doubling wall studs and roof trusses permits wider spacing of these members. Roofing, siding, and interior covering materials are prepared as prefinished components and are designed to span the wider spacing of framing members.

40. Guides to improved frame walls for houses, by L. O. Anderson. U.S. Forest Serv. Res. Paper FPL 31, 28 pp., Aug. 1965.

Research indicates specific construction details to make stronger and more rigid walls for wood-frame houses.

41. Houses can resist hurricanes, by L. O. Anderson and Walton R. Smith. U.S. Forest Serv. Res. Paper FPL 33, 49 pp., Aug. 1965.

Contains details of construction, including fastenings, to provide hurricane-resistant wood-frame buildings. Existing and improved building requirements are

covered, as well as two systems utilizing embedded poles and timbers.

Highly Technical

42. Distribution of wheel loads on timber bridges, by E. C. O. Erickson and K. M. Romstad. U.S. Forest Serv. Res. Paper FPL 44, 65 pp., Oct. 1965

The results of research of distribution of truck wheel loads on typical National Forest timber bridges are presented: (1) load testing of full-size bridge decks under controlled laboratory conditions; (2) load testing of Forest Service bridges in the field; (3) the development of a mathematical analysis of lattice systems for bridges.

Wood Preservation

43. Effects of various preservatives of field boxes on nail holding, by John A. Scholten. U.S. Forest Serv. Res. Paper FPL 42, 9 pp., Oct. 1965.

A study of the effects of various types of preservative treatments for ponderosa pine on the withdrawal resistance of sixpenny, cement-coated nails. Specimens were obtained from field boxes subjected to 5 years of outdoor exposure and subsequent indoor conditioning.

44. Effects of wood preservatives on electrical moisture-meter readings. U.S. Forest Serv.

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Res. Note FPL-0106, 21 pp., Aug. 1965.

Describes the effects that some commonly used wood preservatives have on readings of electric moisture meters when the meters are used to determine moisture content of preservatively treated wood.

Wood Residue Utilization

45. Technical, economic and practical aspects of wood-residue utilization, by Wayne C. Lewis. Forest Prod. Jour. 15(8): 303-307, Aug. 1965.

Analyses of amounts of residue produced and used in the United States in 1962 as compared to 1952 are made in terms of changed practice, improved primary manufacture, and residues remaining unused by kind and by area. Examples are given for the practice of residue utilization as it has developed.

Wood Structure and Growth Conditions

46. Rapid measurement of tracheid cross-sectional dimensions of conifers: Its application to specific gravity determinations, by Diana M. Smith. Forest Prod. Jour. 15(8): 325-334, Aug. 1965.

A technique is described, using a dual-linear traversing micrometer, that offers distinct advantages over previously available methods for measuring cell diameter and wall thickness. The emphasis is on developing methods of measuring and cal-

culating cross-sectional tracheid dimensions and determining specific gravity solely on the basis of cell measurements.

47. Sawing to reduce warp of loblolly pine studs, by Hiram Hallock. U.S. Forest Serv. Res. Paper FPL 51, 53 pp., Dec. 1965.

A study to evaluate the relation of sawing methods, log diameter, juvenile core diameter, log position in the tree, presence of compression wood, log eccentricity, and position of the stud in the log to warp in 2 by 4 studs sawn from small loblolly pine logs.

48. Western wood density survey report No. 1, by Forest Service. U.S. Forest Serv. Res. Paper FPL 27, 60 pp., July 1965.

Mean specific gravities by Forest Survey Units are presented for 9 species of the 23 sampled by the Western Wood Density Survey. Environmental relationships and strength-property relationships with specific gravity are discussed.

49. What can be done about mineral stain in oak? by E. H. Bulgrin. South. Lbrman, 211(2632): 162, Dec. 15.

Mineral stain in oak costs the flooring industry an estimated $95,000 per week in degrade. Little is known about the initiation or formation of stain in oak, and less is known about preventive or remedial measures. This article outlines a coordinated program to solve the problem.

50. What has research done for the sawmill? by F. B. Malcolm. Northern Logger (14): 3,

16-17, 36, 39, Sept. 1965.

The invention of the inserted-tooth saw and the bandsaw made possible developing sawmilling into a major industry within less than 100 years. Developments since have been principally on equipment improvement. This was accomplished through empirical research. More recently controlled research has developed improved sawing methods.

Miscellaneous

51. List of publications on thermal properties of wood, by Forest Products Laboratory. 4 pp., Dec. 1965.

    Contents indicated by title.

52. Wood and the homemaker, by Forest Products Laboratory. U.S. Forest Serv. Res. Note FPL-0107, 5 pp., Sept. 1965.

    The important role played by wood in our homes is emphasized by descriptions of the many applications of wood and wood products encountered by the homemaker in her daily routine.

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